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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

UENO, et al.

Serial No.: 09/479,267

Filing Date: January 06, 2000

For: **SPIN-VALUE MAGNETORESISTANCE
SENSOR AND THIN FILM MAGNETIC
HEAD**

) Appeal No. 2003-0594

) Examiner: Franklin D. Altman, III

) Art Unit: 2652

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Technology Center 2600

Appellant's Brief
(35 CFR § 1.192)

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Commissioner for Patents
P.O. Box 1450
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Sir:

Applicant (Appellant) hereby respectfully submits this brief following receipt of the Notification mailed 09/03/03 in connection with the above-referenced application on appeal to the Board of Patent Appeals and Interferences from the decision of the Examiner of Group Art Unit 2652, dated June 08, 2001, which finally rejected claims 1-4.

An oral hearing is not requested.

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I. RELATED APPEALS

Appellant is unaware of any related appeals or interferences.

II. REAL PARTY IN INTEREST

The real party in interest of Appellant is WESTERN DIGITAL CORPORATION.

III. STATUS OF THE CLAIMS

Claims 1-4 are pending in the application. No claims have been allowed.

Claims 1-4 stand rejected under 35 U.S.C. § 102(e) as anticipated by Aoshima et al. (U.S. Patent No. 6,046,892; hereinafter Aoshima). Additionally, claims 1-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Aoshima, taken alone, or, alternatively, in view of Iwasaki et al. (U.S. Patent No. 6,157,525; hereinafter Iwasaki).

IV. STATUS OF AMENDMENTS

No amendments have been filed after receipt of the Final Office Action.

V. SUMMARY OF THE INVENTION

The present invention relates to a spin-valve type magnetic resistance (MR) sensor for use in a thin-film type magnetic head. The spin-valve MR sensor is characterized by a structure in which a pair of magnetic layers is laminated on a substrate with a non-magnetic layer sandwiched in between to increase magnetic field sensitivity. The magnetization of one of the magnetic layers (commonly referred to as the "pin" layer) is fixed in the direction of the height of the element by an exchange-coupling magnetic field with an adjacent antiferromagnetic layer. The

magnetization of the other magnetic layer (i.e., the "free" layer) can freely be caused to rotate by an external magnetic field. The angular difference in magnetization direction arising between the two magnetic layers causes a change in the resistance of the MR film. Data recorded in the magnetic medium can be detected by means of this magnetoresistive change. (Specification page 1, line 10 through page 2, line 6; Figure 1)

The spin-valve type magnetic resistance sensor of the present invention is made up of layers (sometimes referred to as films) of different materials. The layers are stacked up as follows: insulating layer 1, first base film 21, second base film 22, nickel-iron film 41, cobalt-iron film 42, non-magnetic conducting layer 5, pinned magnetic layer 6, antiferromagnetic layer 7, protective layer 8, and alumina insulating layer 11. Layer 9 is a hard bias layer, and layer 10 is a conductive head. (Specification page 10, line 3 through page 11, line 14; Figure 1)

Each layer has properties determined by its material composition and crystalline orientation. The composition relates to the fundamental atomic elements in the film. Often, as in the Applicants' invention, the composition of elements naturally results in a crystalline structure that is a regular repeating arrangement of the elements. The orientation relates to the angle that such a crystal structure is situated. Composition and orientation are independent of each other; that is, a particular composition does not imply an orientation and a specific orientation does not imply a composition.

It is known in the magnetic recording arts that the characteristics of the antiferromagnetic material change depending on the material of the base layer. (Specification page 10, line 3 through page 11, line 14; Figure 1) Hence, the performance of a spin-valve MR sensor depends, in part, on the characteristics of the base layer material. In the prior art, for example, certain spin-valve MR sensors

provided with a base layer comprising tantalum (Ta) suffer from unstable and unreliable magnetic transducing characteristics. (Specification page 3, line 9-15)

In order to raise reproduction output in a spin valve MR sensor it is also desirable to make the free magnetic layer as thin as possible. However, if the thickness of the free layer is reduced below a certain limit, the (111) crystalline orientation of the free layer becomes inadequate, so that reproduction output declines and the sensor becomes magnetically unstable. (Specification page 3, line 16 through page 4, line 4)

In accordance with the claimed subject matter, a MR sensor structure exhibiting improved performance with thermally and magnetically stabilized magnetic transducing characteristics is produced through the use of a base layer that includes a first film of a nonmagnetic metal and a second base film formed on the first base film. The second base film comprises an alloy NiFeX, where X includes one of Cr, Nb, or Rh. Importantly, the second base film has a face-centered cubic structure and a (111) orientation. (Specification page 8, line 11-21) By forming both magnetic layers, the nonmagnetic layer, and the antiferromagnetic layer of the spin valve film on top of the second base film, the (111) crystal plane orientation is strengthened, resulting in a spin-valve MR sensor that exhibits high relative magnetoresistive change. (Specification page 9, lines 1-7)

VI. ISSUES PRESENTED

The issues presented on appeal are:

1. Whether claims 1-4 are anticipated under 35 U.S.C. § 102(e) by Aoshima;
2. Whether claims 1-4 are unpatentable under 35 U.S.C. § 103(a) over Aoshima; and

3. Whether claims 1-4 are unpatentable under 35 U.S.C. § 103(a) over Aoshima in view of Iwasaki.

VII. GROUPING OF CLAIMS

Claims 1-4 stand or fall together.

VIII. ARGUMENT

A. THE AOSHIMA REFERENCE DOES NOT ANTICIPATE THE INVENTION OF CLAIMS 1-4

Aoshima teaches a magnetoresistive head comprising a bottom underlayer of Ta, a second underlayer composed of NiFeCr alloy, wherein Cr is in a range from 17 to 24.3 atomic percent, and an antiferromagnetic layer of PtMn formed on the second underlayer. Aoshima fails to expressly teach or disclose his second underlayer having a face-centered cubic (fcc) crystal lattice structure and a (111) crystal orientation, as recited in the claimed invention. Aoshima is silent as to the specific crystalline structure and orientation of his second underlayer. The Examiner, however, contends the claimed limitation respecting crystalline structure and orientation to be inherent in Aoshima's second underlayer of NiFeCr, wherein Cr is in a range from 17 to 24.3 atomic percent. Applicant respectfully disagrees.

A single prior art reference anticipates a patent claim if it expressly or inherently describes each and every limitation set forth in the patent claim. *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Inherent anticipation requires that the missing descriptive material is "necessarily present," not merely probably or possibly present, in the prior art. *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citing *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d

1746, 1749 (Fed. Cir. 1991)). In other words, if the limitation of a second base layer having a fcc crystalline structure and a (111) crystalline orientation is inherently disclosed by the NiFeCr underlayer taught by the Aoshima patent, it must be necessarily present and a person of ordinary skill in the art would recognize its presence. Inherency “may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *Id.* at 1269, 20 USPQ2d at 1749 (quoting *In re Oelrich*, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981)).

In support of his position that the fcc structure and (111) orientation is inherent in Aoshima's disclosure of a NiFeCr alloy (wherein Cr is in a range from 17 to 24.3 atomic percent), the Examiner points to Iwasaki, which the Examiner asserts teaches a fcc structure and a (111) orientation of NiFeCr at low atomic percentage of Cr. Applicant respectfully submits that the teachings of Iwasaki fail to support the Examiner's inherency position.

Iwasaki fails to disclose a NiFeCr film with a fcc structure and a (111) orientation. Instead, Iwasaki discloses that if a metal film is disposed on top of a Co based amorphous film, which is itself on top of a fcc magnetic film, that the underlying fcc magnetic film *promotes* the fcc structure with a (111) crystalline orientation of the metal film on top of the Co based amorphous film. (Iwasaki, col. 8, lines 32-36).

As is known in the arts, the orientation of a crystal lattice structure is dependent upon a variety of factors. These factors include energy states, external forces, whether the material is epitaxial grown, sputtered, when nucleation occurs, temperature, rate of cooling, etc., and the underlying surface on which it forms. But none of these factors implies that a film, simply by the nature of its composition, will assume a specific crystalline structure or orientation.

Accordingly, it is respectfully submitted that the claimed limitation respecting a fcc structure and a (111) orientation is not inherent in Aoshima's disclosure of a NiFeCr film (Cr content in a range from 17 to 24.3 atomic %).

B. *PRIMA FACIE* OBVIOUSNESS DOES NOT EXIST WITH RESPECT TO THE REJECTION OF CLAIMS 1-4

Prima facie obviousness does not exist when the prior art fails to suggest or anticipate the benefits of modifying or combining references or when external factors, such as the changing state of the art, fail to provide motivation to one of ordinary skill in the art to make the modification or suggestion. Stated differently, obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). Here, the claimed invention (e.g., representative claim 1) taken as a whole cannot be said to be obvious because there is no reason given in the prior art why one of ordinary skill in the art would have been prompted to modify or combine the teachings of the references in the particular manner suggested by the Examiner to arrive at the subject matter of claims 1-4.

Applicant respectfully submits that a *prima facie* case of obviousness does not exist with respect to the rejection of claims 1-4 and respectfully traverses the rejection of claims 1-4 for lack of *prima facie* obviousness.

1. An Ordinary Practitioner Would Have Lacked Motivation To Arrive At The Claimed Invention In View Of Aoshima

Aoshima discloses a spin valve magnetoresistive sensor 20, as shown primarily in Figs. 4 and 5, including: an underlayer 21 and underlayer 22 formed on top of a substrate (not shown, see col. 3, line 3); the underlayer 21 composed

of a nonmagnetic metal (i.e., Ta) with the underlayer 22 composed of an alloy represented by NiFeX, wherein X includes one of Cr, Nb, Rh and Pd.

Aoshima does not teach, disclose, or suggest a second base film having a fcc structure and a (111) orientation, as recited in claim 1. Aoshima is entirely silent as to the crystalline structure and orientation of his underlayer 22. He merely reports that his PdPtMn antiferromagnetic layer 23 becomes an ordered-alloy and has more fcc structure after going through an anneal process when it is formed on the Ta/NiFeCr underlayer arrangement. (Aoshima, col. 5, lines 1-21) There is no suggestion in the Aoshima patent to form a NiFeCr underlayer having a specific fcc crystalline structure and a specific (111) crystalline orientation. A specific structure in one layer does not necessarily imply or suggest a specific crystalline orientation in the same layer; nor does it suggest a particular structure or orientation in another layer. Because there is no teaching or suggestion of forming a NiFeCr underlayer with a fcc structure and (111) orientation, Applicant respectfully submits that the invention of claims 1-4 would not have been obvious to one of ordinary skill in the art at the time it was made.

2. An Ordinary Practitioner Would Have Lacked Motivation To Modify Or Combine Aoshima And Iwasaki So As To Arrive At The Invention Of Claims 1-4

The Examiner cites Iwasaki as disclosing that NiFeCr inherently has an fcc structure and (111) orientation (Iwasaki, col. 8, lines 32-36), and therefore it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the NiFeCr underlayer disclosed in Aoshima such that it would have a fcc structure and (111) orientation, as taught by Iwasaki. Applicant respectfully disagrees and submits that the Examiner's citation of a single sentence in Iwasaki is taken out of context. Furthermore, it would not have provided any motivation or suggestion to an ordinary practitioner to arrive at the

present invention. A single line in a prior art reference should not be taken out of context and relied upon with the benefit of hindsight to show obviousness. *Bausch & Lomb, Inc. v. Barnes-Hind Hydrocurve, Inc.*, 796 F.2d 443, 230 USPQ 416 (Fed. Cir. 1986).

Iwasaki fails to disclose a NiFeCr film with a fcc structure *and* a (111) orientation. Instead, Iwasaki teaches that if a metal film is disposed on top of a Co based amorphous film, which is itself on top of a fcc magnetic film, that the underlying fcc magnetic film *promotes* the fcc (111) orientation of the metal film on top of the Co (Iwasaki, col. 8, lines 32-36).

The Examiner states that "the fcc structure in an (111) orientation is known to have a highly oriented crystal structure while no magnetic anisotropy appears in this orientation." The Examiner contends that these favorable characteristics would have been realized by a skill artisan. Applicant respectfully disagrees. Applicant contends that Aoshima and Iwasaki could only have been combined in the manner suggested by the Examiner through carefully considered hindsight using the present invention as a reconstructive guide. It is impermissible to use the claimed invention as an instructive manual or "template" to piece together the teachings of the prior art in order to render the claimed invention obvious. *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992). Applicant respectfully submits that the Examiner has used the patentee's claims as a "blueprint" in order to combine the right prior art references in the right ways to achieve the result of the claims in issue. When prior art references require selective combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight obtained from the invention itself. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 227 USPQ 543 (Fed. Cir. 1985); *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546, 48 USPQ2d 1321, 1329 (Fed. Cir. 1998) ("Determination of obviousness cannot be

based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention.”).

In other words, there must be a teaching or suggestion within the prior art, within the nature of the problem to be solved, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources, to select particular elements, and to combine them as combined by the inventor. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 665, 57 USPQ2d 1161, 1167 (Fed. Cir. 2000); *Heidelberger Druckmaschinen AG v. Hantscho Commercial Prods., Inc.*, 21 F.3d 1068, 1072, 30 USPQ2d 1377, 1379 (Fed. Cir. 1994) (“When the patented invention is made by combining known components to achieve a new system, the prior art must provide a suggestion or motivation to make such a combination.”).

Aoshima fails to teach, disclose, or suggest a spin valve MR sensor structure that includes first and second base layers, where the second base layer is composed of a NiFeX alloy, wherein X includes one of Cr, Nb and Rh, and where the second base layer has a fcc structure and a (111) orientation. Similarly, Iwasaki fails to disclose such a structure; nor does Iwasaki provide any teaching or suggestion that would have lead a person of ordinary skill to the claimed invention in view of Aoshima. Aoshima teaches a specific layering of materials in his Figure 5. Iwasaki discloses a method for using a lower film to promote an orientation of an upper film. Iwasaki does not teach that if the upper film has this orientation, then the lower film must necessarily have the same specific orientation. Furthermore, there is nothing in either reference that suggests the combination of the two references in the manner suggested by the Examiner. That is, there is no teaching in the prior art that would have lead one of ordinary skill to combine or modify the Aoshima and Iwasaki references so as to arrived at the claimed invention.

Applicant respectfully submits that the rejection confuses structure and orientation. A specific layer structure does not necessarily imply a specific crystalline orientation, either in the same layer or in another layer. According to the Examiner, a fcc structure necessarily produces or requires a (111) orientation. A face centered cubic structure, as is well known, has four atoms per unit cell, six $\frac{1}{2}$ atoms on each face, and eight $\frac{1}{8}$ atoms at the corners. Additionally, the close-packed direction is (110). Importantly, these structural characteristics are completely independent of any orientation.

It is the burden of the Examiner to set forth a *prima facie* case of obviousness. To carry this burden the Examiner must establish why one having ordinary skill in the art would have been led to the claimed invention by the express teachings or suggestions found in the prior art, or by implications contained in such teachings or suggestions. *In re Sernaker*, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983). There has not been a *prima facie* showing in this case. The Examiner may not rely on a claim of inherency to establish a *prima facie* case of obviousness.

For all of the foregoing reasons, it is respectfully submitted that the rejection of claims 1-4 does not satisfy the criteria to establish *prima facie* obviousness.

IX. CONCLUSION

In sum, with no motivation or teaching that would lead one of ordinary skill to the concept of the present invention, Applicant respectfully submits that the present invention would not have been obvious to a person of ordinary skill in the art at the time it was made. Accordingly, applicant respectfully submits that the appealed


claims in this application are patentable, and requests that the Board of Patent Appeals and Interferences direct allowance of rejected claims 1-4.

This brief is submitted in triplicate, along with a check for \$320.00 to cover the appeal fee for one other than a small entity as specified in 35 C.F.R. §1.17(c).

Please charge any shortages of fees or credit any overcharges of fees to our Deposit Account No. 50-2060.

Respectfully submitted,
BURGESS & BEREZNAK, LLP

Dated: 9/23, 2003


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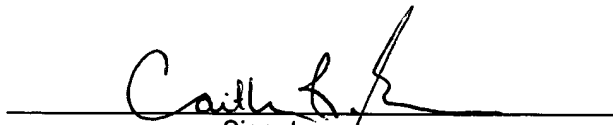
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Caitlin R. Burgess

Name of Person Mailing Correspondence


Signature

9-23-03
Date

Appendix

Pending claims 1-4 are as follows:

1. A spin valve magnetoresistance sensor, comprising:
 - a base layer layered on top of a substrate, the base layer including a first base film having a nonmagnetic metal and a second base film formed on top of the first base film, the second base film having an alloy represented by NiFeX, wherein X includes one of Cr, Nb and Rh, the second base film having a face-centered cubic (fcc) structure and a (111) orientation;
 - a pair of magnetic layers enclosing a nonmagnetic layer layered on top of the base layer; and
 - an antiferromagnetic layer adjacent to one of the pair of magnetic layers.
2. The spin valve magnetoresistance sensor described in claim 1 wherein a film thickness of the second base film is within a range of 20 to 100Å.
3. The spin valve magnetoresistance sensor of claim 1 wherein X is Cr, wherein a content of Cr in the second base film is within a range of 20 to 50 at%.
4. The spin valve magnetoresistance sensor of claim 1 wherein the spin valve magnetoresistance sensor is included in a thin film magnetic head.